Claims 11-29 are added.

REMARKS

Claims 11-29 are pending in the application. Claims 1-10 have been cancelled.

Specification

The information relating to cross-reference to related applications contained in the specification as filed is incorrect. According to the Decision on Petition under 37 CFR 1.137(b) dated August 6, 2002, the present application is a continuation application of the International application PCT/IB00/01369 filed September 27, 2000. The international application claims priority of the prior Swiss application 11788/99 filed 27 September 1999.

A certified copy of the Swiss priority document will be submitted at a later date in order to perfect the claim of priority.

REJECTIONS

Claim Rejections - 35 U.S.C. 112

Claim 1 stands rejected under 35 U.S.C. 112, 2nd paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention because the method of claim 1 describes a desired result. Moreover claim 1 stands rejected as lacking antecedent basis for several terms.

Claim 1 has been cancelled and in its place new claim 11 is submitted. New claim 1 now sets forth three method steps :

a) providing a three-dimensional mat system;

b) infiltrating an aggregate into the three-dimensional mat system;

c) positioning, in accordance with desired performance properties of the concrete member, the aggregate within the mat system according to aggregate size at desired locations in a three-dimensional arrangement determined by the mesh width of the mesh layers by sieving the aggregate through the meshes of the mesh layers.

The new claim 11 thus clearly describes several method steps for producing the concrete member. Also, antecedent basis has been provided for the terms in question.

Claim Objections

Claims 5-10 are objected to under 37 CFR 1.75(c) as being in improper form

because of multiple dependency issues. The claims have been cancelled and the newly submitted claims no longer contains any multiple dependency.

It is therefore respectfully requested that all claims be examined.

Rejection under 35 U.S.C. 102

Claims 1-4 stand rejected under 35 U.S.C. 102(b) as being anticipated by *US 553,305 (Fordyce)*.

The new claim 11 now claims a method of producing a micro-reinforced concrete member with the following steps:

a) providing a three-dimensional mat system comprising mesh layers having meshes of a varying mesh width, wherein the mesh layers are arranged such that the meshes of the mesh layers vary at least in one of a horizontal direction and a vertical direction of the three-dimensional mat system;

b) infiltrating an aggregate into the three-dimensional mat system;

c) positioning, in accordance with desired performance properties of the concrete member, the aggregate in the three-dimensional mat system according to aggregate size at desired locations in a three-dimensional arrangement determined by the mesh width of the mesh layers by sieving the aggregate through the meshes of the mesh layers.

The gist of the invention is that by providing a three-dimensional mat system of mesh layers having meshes of varying width, the aggregate can be positioned in the three-dimensional mat system according to the aggregate size at desired locations determined by the mash width of the mash layers in that the aggregate is sieved through the three-dimensional mat system and its meshes. The mat system with its three-dimensional arrangement of meshes provides a means for positioning the aggregate precisely at predetermined locations and, accordingly, the concrete member based on the placement of the aggregate can be adjusted with respect to the material performance of the concrete member in regard to load capacity, density, durability, ductility, impact resistance, torsion, rotation, crack control connectivity, energy absorption etc.

The cited prior art reference *Fordyce* describes a skeleton for fireproof building construction, wherein the skeleton is to be filled with plaster. Even though the disclosure

of this prior art reference shows in Fig. 10 a fine mesh *b* and a coarse mesh *B*, the entire disclosure is silent in regard to positioning of aggregate according to aggregate size by means of sieving through the different meshes.

First of all, the prior art reference deals with plaster. Plaster is fundamentally different from concrete in that it does not contain aggregate (sand and gravel in different proportions), i.e., particles of greatly varying sizes. Plaster (see attached definition according to Merriam-Webster Online Dictionary) is a pasty composition of lime, water, and sand that hardens on drying and is used for coating walls, ceilings and partitions. Plaster cannot be used as a load bearing member; its only use is that of a finishing coat. Plaster, as a function of its composition, is a uniform pasty mass without having greatly varying aggregate particles contained therein.

Concrete, on the other hand, is a hard strong building material made by mixing a cementing material (Portland cement) and mineral aggregate, i.e, sand and gravel, so that the cement can set and bind the entire mass (see attached definition of Merriam-Webster Online Dictionary). Specifically, concrete is made from about 80 % by volume of (graded) aggregate, comprising three parts sand and two parts gravel, and 20 % by volume cement. This provides a flowable mass that hardens to a strong load-bearing material. See enclosed copy of *Chambers: Dictionary of Science and Technology* (1999), page 190; here, the particulars of cement and concrete are explained.

Thus, based on the different types of material plaster vs. concrete, the skeleton of the prior art and the mat system of the present intention provide different functions. The skeleton of the prior art provides simply a reinforcement of the plaster (see page 2, lines 14 to 16, where it is stated that the skeleton serves to strongly bond and tie the mass). Also, it is clearly stated that the different mesh sizes have simply the function of, in the case of the wider meshes, to easily spread the plaster and to ensure uniform settling of the plaster while the finer meshes retain the bulk of the plaster so that only a small portion of the plaster will pass through the meshes of the sides making available portions of the plaster for smoothing the surfaces. This is described on page 1, line 98, through page 2, line 6. Since plaster is a uniform pasty mass, there is nothing that could be sieved or positioned precisely within the three-dimensional mat system. The plaster has a uniform

appearance as clearly evidenced by the various drawings of the prior art reference.

On the other hand, concrete, as is well illustrated in the schematic provided in *Chambers*, contains aggregate of vastly different sizes and this, in combination with the three-dimensional mat system of the mesh layers having varying mesh widths allows for positioning of aggregate at certain locations within the concrete member in accordance with the distribution of the mesh widths provided in the mat system.

The concept of aggregate distribution across a cross-section of the concrete member that is made possible by the arrangement of mesh layers of varying mesh width is not taught or suggested by the cited prior art reference, particularly, since, firstly, the material used for filling the skeleton has no variation in the particle size (only sand is used in plaster) so that there is nothing to be sieved or positioned at particular locations (page 2, lines 51-57, describes that the plaster passes readily through the coarse meshes and is caught by the side piece where the finer mesh only allows a small quantity of the plaster to pass through, i.e., the side pieces *b* are retainers) and, secondly, the skeleton is provided, as stated in the prior art reference, simply as a structural support.

The present invention provides a sieving (or screening) action for the aggregate by means of the three-dimensional mat system comprised of mesh layers having varying mesh widths so that the individual mesh layers of the mat system act as a template to precisely place the aggregate according to size in the three-dimensional mat structure.

The mat system has several functions: it is a sieve for positioning the aggregate; it acts as a micro-reinforcement; and it provides a template for positioning the aggregate.

The concrete members manufactured according to the present invention enable for the first time a three-dimensional stiffness control in a single concrete member by means of the sieving action of the mat system since the mat system with its varying mesh widths allows a precise positioning of the aggregate at desired locations according to size so that within the cross-section of the concrete member high resistance in compression zones and elastic performance in the tension zones can be produced as desired. This allows a multi-functional multi-layer concrete member that can be manufactured to be very slim (0.5 to 4 inches).

The distribution of coarse aggregate, retained by a mesh layer of a small mesh

diameter, within one layer of the concrete member provides, for example, a modulus of elasticity of 50,000 MPa, while a zone created by a medium mesh width retaining medium size aggregate provides a modulus of elasticity of 35,000 MPa, and a modulus of elasticity of a fine layer created by large mesh width creates a concrete containing fine sand and thus a layer having a modulus of elasticity of 20,000 MPa. Such arrangements are illustrated in the drawings Figs. 9, 10, 11, 12 of the present application.

In summarizing the above, the reference *Fordyce* does not claim any particular sieving effect and distribution of the aggregate across the cross-section of the member since plaster contains only uniform sand. The present invention enables positioning of coarse aggregate in the compression zone and a fine sand zone in the tension zone thus optimizing in a simple way the performance of the concrete member. The precise positioning by means of the sieving action allows for variation of stiffness across the cross-section. The concrete members manufactured according to the invention therefore can provide high stiffness (modules of elasticity) in the compression zone and lower stiffness in the tension zone. Bending tests have demonstrated that the strain in the compressions zone is always smaller than the strain in the tension zone. The variation of stiffness allows an adjustment of the material performance to the real load conditions and deformations. This means that in the compression zone the resistance is increased and in the tension zone the material stays uncracked until the ultimate limit state.

Therefore, the inventive feature of positioning the aggregate according to aggregate size within the three-dimensional mat system at desired locations in a three-dimensional arrangement determined by the mesh width of the mesh layers by sieving the aggregate through the meshes of the mesh layers is not taught or suggested by the prior art reference *Fordyce*.

Claim 11 and its dependent claims are therefore believed to be allowable.

CONCLUSION

In view of the foregoing, it is submitted that this application is now in condition for allowance and such allowance is respectfully solicited.

Please note the attached Revocation of Power of Attorney and new Power of Attorney and Authorization of Agent submitted herewith. Please direct all future

correspondence to the address associated with the provided customer number on the form Power of Attorney and Authorization of Agent.

Should the Examiner have any further objections or suggestions, the undersigned would appreciate a phone call or e-mail from the examiner to discuss appropriate amendments to place the application into condition for allowance.

Authorization is herewith given to charge any fees or any shortages in any fees required during prosecution of this application and not paid by other means to Patent and Trademark Office deposit account 50-1199.

Respectfully submitted on June 6, 2003,

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GEH
Encl.: new claims 11-29 (3 sheets);
new paragraph page 1 (1 sheet);
copies Merriam Webster Online Dictionary "plaster" and "concrete" (2 sheets)
copies Chambers: Dictionary of Science and Technology - page 190 (2 sheets)
time extension petition (1 sheet)
Power of Attorney (1 sheet)
Revocation of Power of Attorney (1 sheet)

NEW CLAIMS 11-29

11. A method of producing a microreinforced concrete member for erection of loaded and/or impervious structures, the method comprising the steps of:

a) providing a three-dimensional mat system comprising mesh layers having meshes of a varying mesh width, wherein the mesh layers are arranged such that the meshes of the mesh layers vary at least in one of a horizontal direction and a vertical direction of the three-dimensional mat system;

b) infiltrating an aggregate into the three-dimensional mat system;

c) positioning, in accordance with desired performance properties of the concrete member, the aggregate in the three-dimensional mat system according to aggregate size at desired locations in a three-dimensional arrangement determined by the mesh width of the mesh layers by sieving the aggregate through the meshes of the mesh layers.

12. The method according to claim 11, further comprising the step of selecting the mesh layers from the group consisting of expanded metal, knotted metal networks, welded metal, and interwoven metal.

13. The method according to claim 11, wherein the mesh layers are arranged such that portions of the aggregate are positioned precisely in intermediate spaces between the mesh layers and act as a spacer while providing a stiffness control in the concrete member based on a variation of an aggregate size and an aggregate weight in the intermediate spaces.

14. The method according to claim 13, wherein, in the step c), the dead weight of the concrete member is adjusted precisely by selecting the aggregate size and a specific gravity of the aggregate positioned in the intermediate spaces.

15. The method according to claim 11, wherein, in the step a), the mesh layers are interconnected.

16. The method according to claim 15, wherein interconnecting elements are provided for interconnecting the mesh layers or the mesh layers are interconnected by interweaving.

17. The method according to claim 15, further comprising the step of adjusting a thickness of the concrete member by performing at least one of:

varying in the step a) a number of the mesh layers;
varying in the step a) the interconnecting elements;
varying in the step a) interweaving of the mesh layers;
selecting in the step b) a type of the aggregate; and
selecting in the step b) the aggregate size.

18. The method according to claim 11, further comprising the step of adjusting a thickness of a steel area within the concrete member defined by the mesh layers within a range of 0.5 % to 12 % of a thickness of the concrete member by performing at least one of:

varying in the step a) a number of the mesh layers;
selecting in the step a) a wire diameter of the mesh layers; and
selecting in the step a) the mesh width.

19. The method according to claim 18, wherein the wire diameter is 0.2 mm to 2 mm.

20. The method according to claim 11, wherein, in the step a), the mesh width is from 3 mm to 50 mm.

21. The method according to claim 11, wherein, in the step a), the mesh layers consist of different types of materials.

22. The method according to claim 11, wherein, in the step a), the meshes of the mesh layers are shaped differently.

24. The method according to claim 11, wherein, in the step a), the mesh layers consist of different types of materials and the meshes of the mesh layers are shaped differently.

25. The method according to claim 11, further comprising the step of prestressing the mesh layers in a prestressing bed.

26. The method according to claim 11, wherein in the step b) the aggregate is a concrete slurry.

27. The method according to claim 11, further comprising the step of selecting

a material of the mesh layers from the group consisting of metal and plastic.

28. The method according to claim 11, wherein, in the step a), the three-dimensional mat system comprises at least three mesh layers, wherein the mesh width of a lowermost one of the at least three mesh layers is < 4 mm, the mesh width of a centrally arranged one of the at least three mesh layers is 8 mm, and the mesh width of the uppermost one of the at least three mesh layers is 16 mm.

29. The method according to claim 11, further comprising the step of adjusting a weight of the concrete member for a preselected volume of the concrete member by selecting in the step b) the aggregate size and specific gravity of the aggregate.

PARAGRAPH TO BE INSERTED ON PAGE 1 AFTER THE HEADING "CROSS-REFERENCE AND PRIORITY CLAIM TO RELATED APPLICATIONS"

This application is a continuation application of international application PCT/IB00/01369 filed September 27, 2000, now abandoned, and published in German on April 5, 2001 (publication number WO 01/23685), claiming priority of Swiss patent application 1788/99 filed September 27, 1999.

Merriam-Webster DICTIONARY

8 entries found for plaster.
To select an entry, click on it.

plaster[1,noun]
plaster[2,verb]
court plaster
mustard plaster
plaster cast
plaster of paris

Go

Main Entry: [1]**plas·ter**
Pronunciation: 'plas-t&r
Function: *noun*
Etymology: Middle English, from Old English, from Latin *emplastrum,* from Greek *emplastronomer,* from *emplassein* to plaster on, from *en-* + *plassein* to mold, plaster; perhaps akin to Latin *planus* level, flat -- more at FLOOR
Date: before 12th century
1 : a medicated or protective dressing that consists of a film (as of cloth or plastic) spread with a usually medicated substance <adhesive *plaster*>; *broadly* : something applied to heal and soothe
2 : a pasty composition (as of lime, water, and sand) that hardens on drying and is used for coating walls, ceilings, and partitions
- **plas·tery** /-t(&-)rE/ *adjective*

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7 entries found for concrete.
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concrete[1,adjective]
concrete[2,verb]
concrete[3,noun]
concrete music
concrete poetry
musique concrete

Go

Main Entry: ^{3}**con·crete**
Pronunciation: 'kän-"krEt, (")kän-'
Function: *noun*
Date: 1656
1 : a mass formed by concretion or coalescence of separate particles of matter in one body
2 : a hard strong building material made by mixing a cementing material (as portland cement) and a mineral aggregate (as sand and gravel) with sufficient water to cause the cement to set and bind the entire mass
3 : a waxy essence of flowers prepared by extraction and evaporation and used in perfumery

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CHAMBERS

DICTIONARY OF SCIENCE AND TECHNOLOGY

General Editor
Professor Peter M B Walker, CBE, FRSE

CHAMBERS

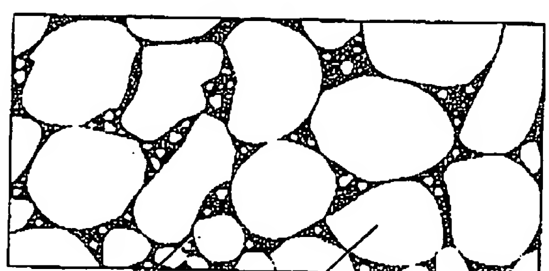
Cement and concrete

Concrete, whether reinforced or not, has become the most widely used civil engineering material. It is made of cement and aggregate, which may have a particular size distribution, mixed with water. Adding water initiates the setting reaction between it and the cement, binding the whole mass together to form concrete. Concrete has the great advantage as an engineering material that during the first few hours of setting the material remains pourable and workable. As a fluid, it can readily be moulded into complex shapes *in situ*, yet subsequently it acquires properties similar to those of natural stone. The most frequently used cement, especially in the UK, is **Portland cement**, although different materials are used in other parts of the world.

Portland cement is made from a mixture of about 75 wt % limestone, $CaCO_3$, and 25 wt % clay, principally aluminosilicate, but with a significant iron oxide and alkali oxide content. These are ground together and fired with coal in air at up to 1500°C to produce a clinker, which, in turn, is mixed with 3–5 wt % of gypsum and ground again to give cement powder, with a mean particle size of under 10 μm. The particle size is important – the smaller it is, the faster is the setting. The powder is a complex mixture of multicomponent, mineral solid solutions, the principal constituents of which are (approx. wt %): *alite* (tricalcium silicate, $CaO.Ca_2SiO_4$) 55, *belite* (dicalcium silicate, Ca_2SiO_4) 20, *aluminate* (tricalcium aluminate, $2CaO.Ca(AlO_2)_2$) 12, *ferrite* (tetracalcium aluminoferrite, $(4CaO.Al_2O_3.Fe_2O_3)$ 8, *gypsum* (hydrated calcium sulphate, $CaSO_4.2H_2O$) 3·5 and *oxides* (K_2O, Na_2O, CaO) 1·5.

The sequence and variety of hydration reactions during setting and hardening are also complex, and are still being elucidated. The polymerization of silica, to form an interlocking network of foils and fibres of silica gel around each cement particle, plays an important role, as do the formation and interlocking of needle-like crystals of ettringite, a heavily hydrated calcium aluminosulphate with plate-like crystals of portlandite, $Ca(OH)_2$. The initial setting reaction is very rapid, with a high exotherm, 200 W kg^{-1}, within 30 s. This falls to about 1 W kg^{-1} after an hour, and the cement continues hardening at an increasingly slow rate with changes still detectable after 30 years! Some 40 wt % of water is required for complete hydration.

The tensile strength of hardened cement (about 3–5 MN m^{-2}) is only about 10% of its compressive strength, largely due to porosity, the pores of up to 1mm in size acting as stress concentrators. Its **Young's modulus** is about 30 GN m^{-2}, but it shows partially viscoelastic behaviour. Additives, known as *admixtures*, are used to control such properties as viscosity, setting time, freezing temperature, pore size and permeability to water. Macro-defect-free (MDF) cement is made by adding about 5% of polyvinyl alcohol, mixing like a dough and compressing. The material has a maximum pore size of 15 μm and a tensile strength of about 60 MN m^{-2}.



Concrete made with graded aggregate

Concrete is made from about 80 vol % of (graded) aggregate, containing three parts sand to two parts gravel, and 20 vol % cement (see diagram). In reinforced concrete, the concrete is poured around an assemblage of heavily cold-worked, mild steel reinforcing bars, held together with links made from a soft mild steel. The steel bars are positioned to resist the anticipated tensile stresses in the structure, some of which can be the result of shear and bending. Beams are designed so that the steel carries all the tension, the concrete being allowed to crack in tension, but required to resist loads in compression. *Prestressed concrete beams* are arranged so that all the concrete is under compression. This is applied by high-tensile steel wires which are either held in tension as the concrete is cast around them and then unloaded after the concrete has set (*pretensioned*), or the wires are fed into ducts cast in the concrete and tensioned after the concrete has set (*post-tensioned*). For a given bending stiffness, prestressed concrete only requires about half the mass of concrete and a third the mass of steel compared to a reinforced concrete beam.

cementstone (manufacture
Cenomanian (taceous. See
Cenozoic (*Geo* covering appr includes the *Cainozoic*. See
censer mechan the seeds are s aways in the v
censor, censo powerful unc which preven the individual responsible f densation pres
cent (*NucEng*) U dollar.
Centaurus (Cen stellation, wh (Proxima Cent
Centaurus A (in the sky, also Associated wit Mpc.
center (*Genrl*) US
centering (*CivEn*
centi- (*Genrl*) Pre Symbol c.
centigrade heat to 0·01 times th of air-free water standard atmos
centigrade scale graduating a th temperature be pure water at parts, each of w point is made temperature on by 1·8 and add 273·15. See Cels
centimetre (*Genr* the metre. Abbr
centimetre-gram
centiMorgan (*Bio* of two genes on *crossover frequency* crossingover; on when summed loci.
centipedes (*Zool*):
centipoise (*Phys*) viscosity. Symbo
centistoke (*MinE* cosity of oils. Re equivalent to the
central angle (*M* circle.
central dogma (*B* resides in the n quence, but cann
central force (*Phy* point experience and the point. If derived from a p only of the dist where $V(r)$ is momentum.
central lubricatin lubricating system single pump via p of the pump pro